<Part IV THE FORMATION OF A MODERN TIMEFRAME>The Spread of Timepieces in the Meiji Period

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The Spread of Timepieces in the Meiji Period

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1 THE FIRST CONSUMER DURABLE FROM THE WEST

After the opening of Japanese ports in the late Edo period, trade with Europe and America expanded. Timepieces entered the country along with other items. Over the course of the Meiji era, timepieces became the first Western consumer durable to take root in the daily life of ordinary Japanese. This point can be substantiated, as I will show in this paper, by the increase in the rate of diffusion of timepieces.

Broadly speaking, the spread of timepieces was without a doubt a part of the process of Westernization referred to in Japan as "civilization and enlightenment." Specifically, this meant that the use of modern Western technology became increasingly dominant within Japanese society, and goods produced using this technology grew in number. It cannot be said, however, that this process of Westernization was equally evident throughout the society. A close look at this process reveals differences in the level and speed with which Western technologies and goods based on Western technology penetrated into Japanese society—differences which arose due to the technology itself as well as the nature of the products.

The newly introduced systems rendered the old ones obsolete in areas subject to government spending, such as transportation and communications systems (e.g., railroads, shipping, and telephone and telegraph) and Western military infrastructure (including cannons and warships). Investments by companies in the new mining industry, too, brought about radical changes in production methods thanks to their use of imported machinery. Traditional economic history, however, has always emphasized this kind of dramatic change in investment goods, creating a mistaken impression that this type of Europeanization occurred at all levels of Japanese society.

The situation with consumer goods was different. In terms of everyday life for the people—food, clothing, and shelter—Westernization proceeded at a much slower pace. Japanese material culture, which had matured through development of original technologies intimately tied to the climate and geography of Japan during the Edo period under the policy of national isolation, continued strong in daily life despite the changes brought by opening the borders, the Meiji Restoration, and finally the Industrial Revolution.[1] At least through the Meiji and Taishō Periods, Japanese food, Japanese attire, and Japanese houses were the basis for everyday life, which meant that the preponderance of household spending habits remained unchanged from the Edo period, and

that consequently only a small part of the national economy was made up of money spent for Western consumer goods. Government and company workers might spend their days in Western buildings wearing Western-style clothing, but once they got home they changed into kimonos, sat on tatami mats, and ate rice for the third time that day. Looking at the progress of Western attire reveals that until around 1900 only a part of a city man's wardrobe for leaving the house consisted of Western clothing. Even into the Shōwa period entering the 1930s, there was no Western attire to be found at all in rural farming villages. Western dress had only become common for men and children to wear outside the house in the urban areas, while with few exceptions women continued to wear kimonos. The introduction of Western technology to spinning factories may have changed the production process for an intermediate product like textiles, but the majority of textiles, which were the final product made from such materials and destined for domestic consumption, were narrow cloth for traditional Japanese attire.[2]

Looking at these trends from a macroeconomic perspective also reveals that household consumption made up 60-80 percent of the total national income, indicating that Westernization proceeded rather slowly—a fact which should receive greater treatment in historical interpretation. Furthermore, while a Western-centered value system might judge this as evidence of a "slow rate" of Westernization, it would be more accurate to see this as demonstrating the high quality of traditional Japanese material culture, amid the diversification of civilization.

I have made an effort to emphasize the fact that Meiji and Taishō Westernization was limited to investment and production goods while everyday consumption supported Japanese-style goods because it is very easy to think of the spread of Western-style timepieces as a natural phenomenon resulting from the rising tide of Westernization. The fact of the matter is that Japanese society underwent a "selective Westernization" and that the spread of timepieces was an exceptional phenomenon. One particular Western article—the timepiece—was chosen by the average Japanese from among a large number of other consumption goods that were also available.

Indeed, we must take a closer look at Westernization of consumer durables, as the timepieces of the day were valuable consumer durables to be used for a lifetime, or perhaps even be passed down for several generations. Typical consumer durables in an average Edo period household would include such household items as futons, *tansu* (shelf-dresser combinations), *hibachi* braziers, flower vases, iron kettles, lanterns, *shichirin* cooking stoves, and *hakozen* (small lidded boxes used during meals as tables and to store tableware), and other small items for personal use such as combs, *kanzashi* (ornamental hairpins), pipe trays, and *netsuke* (carved ornamental toggles worn at the kimono sash). Wealthier households would have such items as scrolls, low writing desks, and clothes chests, as well as silk clothing for new brides moving in with their husbands and which would be passed down from generation to generation. That such items were considered consumer durables is attested to by their being referred to as "*tansu* fillers." Such items were consumer durables, in the same category as Japanese clothing and houses, which is

why they continued to be bought and used throughout the Meiji and Taishō periods when Japanese styles of dressing and living continued.

What about Western-style consumer durables other than timepieces? Western furniture and accessories entered the average Japanese household only during the Shōwa period, with the advent of Western-style rooms and clothing. Individuals began buying bicycles starting in the fourth decade of Meiji (1898-1907), but the cut of Japanese attire prevented their popularization. Besides that, the price of a bicycle was equivalent to two or three months' salary for the average worker, so bicycles were closer to investment goods for commercial enterprises than consumer goods before the Taishō period.[3] Besides timepieces, the only Western items to make any headway into the Japanese lifestyle of the Meiji period were lamps and eyeglasses. Oil lamps were welcomed as a source of light that was brighter and easier to use than the traditional lanterns and candles. Lamps were probably used even more widely than timepieces as a household necessity before the Taishō period brought general electrification of the country. However, lamps and eyeglasses were much cheaper than timepieces. The spread of cameras, gramophones, fans, sewing machines, and irons for personal use began in the Taishō period. So it may be said with confidence that timepieces were the first Western consumer durable in Japan.

Japanese timepieces had been made since the Edo period, and their mechanisms were well understood. Japanese timepieces are a variation on the Western mechanical timepieces brought to Japan by Portuguese and Spanish visitors in the sixteenth century. They were exactly like the imported timepieces brought in after the ports were opened, in that the time of day could be measured by the position of the hands spinning around the circular face. Japan in the Edo period was the only country in the world outside of Europe not only to have produced its own mechanical timepieces, but further to have adapted them to the variable-hour time system used at that time, which is described below. It is worthwhile to consider whether this experience with timepieces was a factor in the particular spread of timepieces during the Meiji period.

Looked at from the point of view of diffusion of timepieces, one cannot consider the period from the end of the Edo period and into the Meiji period as one continuous process. There is a distinct disparity in quantity and price. There is absolutely no evidence remaining which might suggest the extent to which Japanese timepieces were produced and kept in the Edo period. Most important daimyo had their own personal clockmakers, and clockmakers in large cities such as Edo, Osaka, and Kyoto had shops that sold timepieces to the general public. Some ukiyoe prints depict timepieces in the background, and many Japanese timepieces are found in museums both in Japan and abroad.[4]

In other words, it is impossible to make a quantitative comparison of the spread of timepieces in the Edo and Meiji periods. However, as one may surmise from the fact that the large "lantern clocks" representative of Japanese timepieces at the time were also known as "daimyo clocks," these were luxury items out of reach of all but the highest ranking samurai, the large temples, and part of the wealthy merchant class. The reason

was their extremely high price, which was the result of the long hours and specialized skills that went into their handcrafted production. A timepiece made in Genna 9 (1623) for the head of the Owari clan by Tsuda Jozaemon the First, was sold for 102 *ryō*, while a timepiece made in Kansei 9 (1797) by Tsuda Jozaemon the Seventh, which took a whole year to complete, was sold for just over 78 *ryō*. In Kōka 4 (1847), the head of the Tsugaru clan ordered a timepiece from the clockmaker Kunohe Tōkichi, and was quoted 2.2 *monme* of silver (one *monme* is approx. 3.75g) for a day's worth of labor, multiplied by 2,845 days. In actuality, it took three years to make. When considered in terms of the prices of that time, when one *koku* of rice cost around one *ryō*, one "lantern clock" would cost around ¥10 million in today's money (or $100,000, assuming a rate of 100 yen to 1 dollar). This was in addition to the yearly allowance paid to the clockmakers for maintenance work including repairs and adjustments for the variable-hour time system, described below.[5]

Besides the "lantern clocks," smaller Japanese timepieces with simpler designs were also developed, such as "pillar" clocks and "table" clocks. We do not know how much they cost, nor how far down the socioeconomic scale they were available, although they were probably more abundant than "lantern clocks." Examples of other non-mechanical timepieces also remain, such as the "incense clocks" found in temples and the compact "sundials" that came together as a set with brush holders, indicating that the concept of "time-keeping" and the existence of timepieces were known to the common folk, although the number of households which owned an actual timepiece was certainly negligible.[6]

What distinguishes timepieces from other consumer goods is that the time they display is defined by a unified societal time system, thus making them what could be called devices of "social information." Stated simply, all watches must tell the same time. The standard that defines the correct time is a public timepiece in the possession of a political or religious authority, as the case may be. Although this time system is at bottom based on a natural phenomenon common to all geographical regions involving the alternation of day and night due to the spinning of the earth, its significance and its functionality were defined differently, the former by the historical background, including cultural considerations of a political, economic, and religious nature, and the latter by the technical limitations of timepieces as measurement devices.

Edo period castle or temple clocks fulfilled such a societal function by letting everyone within earshot of their drums or bells know the time, so they should more properly be classified as public goods than as consumer durables.[7] In this sense, Japanese timepieces inherited the role of tower clocks found in some churches and town halls in renaissance Europe, of which they were direct descendants. They differed, however, in that while European clocks displayed over squares and plazas had a clock face which allowed anyone seeing them to tell the time from the continuous movement of the hands, Japanese clocks only announced the time intermittently, through the drums or bells which were beaten or rung only a few times a day. This difference underlines how

the Japanese concept of "time" radically changed with the coming of the Meiji period, although the same word continued to be used. The Western (i.e., post-1868) concept of time assigns a particular time to each instant in the day, which is connected to all other instants in a systematic structure.

Clocks were developed within a similar paradigm, with hours divided into minutes, which were in turn divided into seconds, with the number of hands growing to reflect this segmentation. Pre-Meiji time, on the other hand, was seen as something divided subjectively into time periods of varying length. Japanese clocks had without exception only one hand, and the lines on the clock face were for the most part nothing more than divisions between the words designating the time of day, rather than accurate indicators of a fixed time. Western time, with its minutes and seconds, was as absent from the faces of Japanese timepieces as it was from the minds of the Japanese in the Edo period.[8]

One characteristic of the Edo period time system was a system of seasonal time, which employed a "variable-hour" time-allotment system. A time system dividing the day up in accordance with the eastern zodiac, which designated midnight as "the hour of the rat," etc., had been transmitted to Japan from China. A wooden plank was recently unearthed at an archaeological site in Kamo, Ishikawa prefecture, with the words "leave in the morning at the hour of the tiger to work in the field, come home in the evening at the hour of the dog" written on it, proving that this time system had already spread throughout the country by the first half of the Heian period (ninth century).[9] This time system also employed a repetition from "nine" to "four" for midnight and midday, or a variable-hour time system in which sunrise was "the hour of the rabbit" or "morning six" and sunset was "the hour of the cock" or "evening six," no matter what time of day they actually occurred.[10] This system worked well in a society where people labored during the day and rested at night, in synchrony with the differing lengths of day and night with the changing of the seasons. Located at a medium latitude, Japan does not experience very much variation in the length of the day from season to season, which meant that a variable time system did not create any inconveniences for the Edo period political and economic system. In contrast with this, the length of the day during the summer and winter solstices in Europe can vary by as much as up to ten hours, which made it impossible to match working and other societal functions with the natural alternation of day and night, necessitating a fixed-hour time system that would define a set time to be used throughout the year.

Time measured by mechanical timepieces that are controlled by a regular swinging and completely unconnected with the seasons is essentially fixed-hour time, and the mechanical European timepieces imported at the beginning of the Edo period were incapable of displaying variable-hour time. Japanese timepieces, on the other hand, were designed by Japanese clockmakers specifically so as to allow conversion to variable-hour time. Various methods were developed so that lantern clocks could be adapted to variable-hour time. These included putting grooves on the foliot (a type of horizontal pendulum) and changing the weights to after the period of the oscillation in order to speed

up or slow down the clock. Another method employed two balances—one for day, one for night—to change the speed of the clock as needed. A method was even developed whereby the day and night balances would automatically switch. An even more deceptively easy invention was a movable chapter on the dial, whereby the position of the characters on the clock face would be moved by hand according to the season. Pillar clocks employed a similar system, but using a movable scale that would be matched to the position of a descending weight. One ingenious system developed early in the Edo period used the pillar clock weights in conjunction with something similar to a statistical curve. The position of the weights would be marked on monthly lines, and the lines corresponding to each hour of the day would be connected in a curve joining the different months, thus allowing time to be measured differently according to the month.[11]

These innovations show the unique development of mechanisms and the precise nature of craftsman technology that existed in the Edo period. However, the complexity of the mechanism required for the conversion to variable-hour time and the act of moving the positions by hand sacrificed the very goal of the oscillation of mechanical timepieces—isochronism, or "uniform time" (i.e., the most equal and accurate measurement of time possible)—and rendered the information provided by those timepieces at best a rough and only approximate indication of time. The development of Japanese timepieces essentially stopped at the level it had reached in sixteenth-century Europe, and could not therefore achieve the isochronism of later Western timepieces made possible by the development of pendulums, hair springs, balance rings, and anchor escapements.[12] Due to the fact that variable-hour time treats day and night as separate entities and does not value isochronism, the technical limitations of the timepieces of the day posed no difficulties. Even "incense" clocks, which measured time by the amount of ashes piled up or by the speed with which they burned, and therefore obviously indicated a different length of time every time they were used, were judged sufficient for their purpose. The Edo period concept, described above, of varying lengths of time worked very well with the variable-hour time system shown by Japanese timepieces.

Thus there were two varieties of time-data: one, shown by Western timepieces imported in the Edo period and the result of a dedicated pursuit of accurate measurement of fixed-hour time; and another, shown by Japanese timepieces, which was of a very different nature. This split existed despite the fact that both Western and Japanese timepieces were descended from a common mechanical ancestor. Therefore, a politically instigated switch from a variable-hour to a fixed-hour system was a necessary condition for Western timepieces to become a consumer durable. As long as Japanese people continued to use the Japanese variable-hour time system, Western timepieces with their fixed-hour representation of time would be useless. And this political impetus came in the form of the calendar revision of 1873.

The Imperial Edict on Revising the Calendar promulgated on the ninth day of the eleventh month of Meiji 5 (1872), ordered the conversion from the lunar calendar to a solar calendar, which meant taking the dramatic step of shifting the date from the third

day of the twelfth month of that year to 1 January of the next year. It also prescribed abolishing the old variable-hour time system and introducing the fixed-hour system for public use. The relevant passages are excerpted below.[13]

> . . . in order to modernize our country and reform the ancient customs with the goal of moving forward into the realm of civilization as a people, it is of utmost urgency that we hereby rectify the calendar law….The present system whereby one day is divided into one hundred hours, defined in duration by the length of day and night, creates great inconvenience in its general application in all enterprises….This [new] system, which has helped our country's government in all spheres since the establishment of international ties with other lands, must be adopted….We hereby order that the solar calendar be published throughout the land, using an equal number of hours to divide day and night, thereby reforming the time system, not only in order thereby to put right the calendar law, but to promote the enlightenment of the people, as well. . . .
>
> Whereas, until now the system of hours has been comprised of a rendering into twelve hours varying in duration in accordance with the length of day and night, we hereby newly establish a system of time comprised of twenty-four hours equal in duration for both night and day, dividing the period of time lasting from the hour of the rat until the hour of the horse into twelve hours, and naming this period "forenoon," and dividing the period of time lasting from the hour of the horse until the hour of the rat into twelve hours, and naming this period "afternoon."

The philosophy behind the edict was based on the notion that the traditional time system was a barbaric custom of a bygone era, and that conversion to the Western fixed-hour system was necessary for the progress of civilization. While this was in part simply an attempt by the new Meiji government to repudiate previous systems put in place by the old bakufu government and thereby demonstrate its progressiveness, one can, at the same time, read here the necessity the new government was facing of tackling the problem of how to adapt to an internationally used time standard—a consequence of deepening relations with foreign countries ever since the ports had been opened. The nature of timepieces described above as a social standard meant that with the revision of the calendar, Japanese timepieces were rendered useless from one day to the next, and that only Western timepieces from then on had any practical value as a consumer durable. This is the most important reason timepieces were bought at a rate higher than for any other Western consumer durable.

2 IMPORTED AND DOMESTIC

Just because Western timepieces began to be imported, it does not necessarily mean that they were widely disseminated. It certainly is not a case of a nation of people accustomed to a lifestyle without timepieces, which were rare to begin with, suddenly running out and buying them. Indeed, the lifestyle of everyday folk continued for a significant time to be dominated by the old concept of time free of notions of minutes and seconds and dividing day and night up into unequal parts. Even today vestiges of the old system remain in the shape of words such as *shōgo* ("even horse" = noon), *ushimitsudoki* ("ox three time" = the dead of night or the witching hour), and *oyatsu* ("eightses" = snacks or snack time).

One question which arises is how far into rural areas the changes in the time system established by the edict could actually spread at the beginning of the Meiji period, when means of mass communication were still undeveloped and the furthest branches of government agencies were still suffering from the aftershock of the old system of domainal administration being abolished and replaced by the modern prefectural system. The change in the date would have been found out about rather quickly as all written documents had to carry a date. But the time of day was only used in announcements for gatherings or appointments, if then, and use of the old system in personal documents created no problems whatsoever. Fukuzawa Yukichi, spotting an opportunity, published a *Discourse on the Revision of the Calendar* on the very day of the revision of the calendar. This twelve-page woodblock-printed pamphlet apparently sold hundreds of thousands of copies. In terms of explaining the changes to the time system, there is only a two-page description of how to read a clock at the end of the pamphlet, but it is thought that members of the intellectual class (people such as ex-samurai, wealthy merchants, and village headmen) spread the knowledge they gained from this book to those around them.[14]

It was, however, impossible to gain a concrete understanding of the new time system without an actual Western timepiece. And indeed, it was as educational devices that the first imported timepieces were used. Before timepieces could spread as personal consumer durables, clock towers were built for display to the general public. In 1869, before the revision of the calendar, it was announced in the press that the local authorities had "received permission to ring a Western bell in the Nogenoyama district of Yokohama, to plant many cherry trees in the area, set up a tea shop and lay walking paths. . . . A diagram shall be made in accordance with the seasons, and the time shall be marked by the short hand, thus working to educate people to regard this time as their own." It is clear that the clock in question was an imported Western one with a minute hand, and that some method was used to convert this to variable-hour time.[15]

In 1875, three Tokyo craftsmen got together and planned to build four public clock towers.

On the 20th, Satō Jihei, stonemason, of 23-2 Hamamatsu-chō, Shiba, Satō Shōgorō,

> stonemason, of 5 Nanaken-chō, Shiba, and Jibiki Eizō, stonemason, of 3 Minami Sagaraki-chō, went to the Prefectural Hall to apply for permits to build large clock towers at their own expense, to clearly display the time both day and night for the convenience of the general public. The clocks shall be located at Shibaguchibashi, Kyōbashi, Nihonbashi, and Banseibashi bridges. The stone shall be brought to the open lots at the ends of the bridges to be built there, with weather vanes and signs indicating the cardinal directions at the top. An investment of 780 yen is estimated with a monthly cost of 35 yen for maintenance. We ask the government to purchase the necessary 30 *tsubo* parcels of land at each location, four *tsubo* to be used for the clock tower and the remaining 26 *tsubo* being used for stone houses, a cargo loading and transportation guardhouse, and the rest being used for shops to be leased, the proceeds of which shall be used for monthly expenses incurred by the clock tower, with the aim of providing a public good that will last for all eternity.[16]

Since this plan was proposed after the revision of the calendar, it is assumed that the clocks they had in mind were imported Western clocks. We do not know whether they succeeded in their plan. It is likely that the clocks were simply a front, and that their real goal was getting the government to sell them the land.

According to *Tokeishi nenpyō* (Chronology of the History of Timepieces), the first clock tower built in Japan was at the Imperial Guard Company quarters at Takehashi built in 1871, which was followed by towers at the Tokyo Post Office and the Osaka Railroad Depot in 1874, and at the Army Officers' School in 1875—all public construction projects. The first private clock tower was built that same year (1875) at the Tokyo flagship store of the Minatoya Meat Company. Beef stew and clocks were both symbols of "civilization and enlightenment" in the Japanese capital. By 1877, clock towers were built at the First Domestic Industrial Exhibition held in Tokyo, at Hongō Medical School (which was attended by Mori Ōgai), at the Kyōya Clock Store, at the Kobayashi Clock Store, at Iwakamerō (the Yokohama assembly house), and at the Gotō Clock Store in Nagoya. Large cities saw clock stores appear which began selling customers timepieces as a consumer durable, using their clock towers as landmarks.[17]

Only imported timepieces were sold, as domestically produced Japanese timepieces had lost their value. European and American timepieces came in two types: clocks (wall and stand clocks) and watches (pocket and wristwatches). As consumer durables, the former are classified as household goods and the latter as personal accessories. This meant that a household would own one clock, which became a household fixture and remained in the same location, whereas individuals would own watches that they carried around with them. In Meiji period Japan, it went without saying that American clocks and either Swiss or American pocket watches were imported. The limited number of exporters of timepieces to Japan was the result of competition and concentration due to technical progress in Europe and America.

The mechanical timepieces built in thirteenth-century Italy and Bavaria were large

clocks, and until the fifteenth century were used exclusively as public clock towers. Members of the aristocracy and wealthy merchants, however, began owning timepieces, and standing clocks were created. These are the timepieces that came to Japan and were adapted to become Japanese timepieces. At this time in Germany and France the spring was invented to replace the conventional vertical weight, and the balance rings and the balance spring were invented to replace the foliot and the crown wheel, making possible the first pocket watches. In the seventeenth century, the Dutchman Christiaan Huygens invented the pendulum clock, and grandfather clocks began to appear in many households. In the eighteenth century production of both clocks and watches was highest in England, bringing with it the introduction of compact machine tools such as the gear-cutting machine as well as a division of labor for parts and assembly. Improvements in British naval techniques brought about the development of the marine chronometer able to accurately measure seconds, needed to determine lines of longitude. This kind of progress contributed to improvements in the accuracy of timepieces for personal use. The presence of minute and second hands became commonplace. The nineteenth century saw a rapid increase in the production of watches in rural farming areas in Switzerland, making them that country's biggest export industry, and overwhelming their British competition with their low prices and varied designs. During this time the huge influx of immigrants to the U.S. led to an increase in the number of households, and mass production of grandfather clocks for the general public began, using a set standard to ensure parts were interchangeable. This method was also employed in the production of watches, which also made their way into the export market. The U.S. and Switzerland were the preponderant exporters of timepieces during the 1860s, just when Japan opened its ports to foreign commerce.[18]

Trade does not function solely based on the laws of economics but also as the sum total of all actions taken by merchants on the importing and exporting sides of the equation. In the case of Meiji importation of timepieces, cooperation between these two sides was key. Trading houses from both the U.S. and Japan, located in the foreign neighborhood in Yokohama, the main open port for Japan, became the frontline for importing timepieces into Japan. Already in 1862 there had appeared an illustration of an English clockmaker in the *Yokohama kaikō kenbutsushi*, and a British consular report that year announced that trade had begun with around 100 timepieces. Trade statistics for 1868, the first year for which such data is available, show that 1,185 wall and stand clocks and 300 pocket watches were imported. According to a directory published for foreign residents until 1887, eighteen overseas trading houses in Yokohama handled timepieces, of which three were American, one was German, and fourteen were Swiss, giving the Swiss an overwhelming majority. You can sense the determination of the Swiss watch merchants, whose main object was exporting. Working in the middle were the "*établisseurs*," or local offices of wholesalers who provided pocket watches targeting the Asian market with parts made in homes as a cottage industry and assembled in various small establishments.[19]

The first job of the foreign trading houses in the Yokohama area was sales and repairs of timepieces, which were a daily necessity for foreigners living there, but still impossible to acquire in Japan. They also handled tuning and repairs of chronometers on foreign ships which frequently came and went in the harbor. These services were an absolute necessity for Americans and Europeans in Yokohama, which was located at the very end of the long journey across the Pacific. Activities by the powerful Swiss merchant Faberbrand extended beyond sales of timepieces from his native country to encompass transfers of rifles for a profit during the 1868 fighting between the new Meiji forces and Tokugawa diehards. Most of the clock towers built in the early Meiji years, mentioned earlier, were subcontracted by him, and were of British manufacture. It is believed that with growing domestic demand in Japan, foreign merchants started buying timepieces on margin and then wholesaling them to Japanese timepiece merchants.

One reason clocks were imported in greater numbers than watches was that installation in public buildings, schools, companies, and banks proceeded faster than the rate at which they diffused into general households. By 1887, the total number of clocks imported to Japan reached around 700,000, which is believed to be dozens of times higher than the total ownership of Japanese timepieces in the Edo period. In that year, counting all the locations which probably had to have clocks installed, we come up with the following figures: 30,000 schools, over 10,000 city and town halls, 4,500 post and telegraph offices, 4,800 police stations, 500 hospitals, 2,000 banks and companies. In addition to this, there were other official and public facilities such as railroad stations and military barracks, large department stores, as well as places which owned more than one timepiece. Looking at all this together, we can deduce that 10-20 percent of all clocks were purchased either as public goods or investment goods. Having observed this, what is noteworthy is that even more timepieces had already spread as consumer durables for the household.[20]

One factor promoting the growth of general demand was the relatively inexpensive price of imported timepieces compared with their Japanese counterparts, as well as the fact that they could be taken home immediately after purchase, without the long wait necessitated by Japanese timepieces. This was because of mass production in the U.S. and Switzerland, which managed to keep costs down while maintaining high quality. The price of an American grandfather clock in the decade from 1888 through 1897 was around 5 yen, while Swiss pocket watches went for between 5 and 20 yen. Day laborers at that time made barely 20 sen (100 sen = 1 yen) a day, so timepieces were definitely not within reach of the working class. However, government officials with university degrees and bank employees received a yearly salary of approximately 35 to 50 yen their first year, which meant that they could buy one if they saved up for several months.[21]

The price difference for pocket watches was mainly due to the case, which was either nickel, silver, or gold. Watches today have practical and decorative aspects, and it is mainly the latter which raises the price. A gold watch was a rare and expensive imported article, and as such was treated as a status symbol. Watch stores often doubled as jewelers

as well, and this can be seen even today at, say, Wakō and Tenshōdō in Ginza. A pocket watch of precious metals was also convenient as an item that could be pawned.

That pocket watches were an item that was sought after is evident from the fact that top graduates from the Imperial University as well as the army and navy academies were given one as a graduation present from 1890 on. One odd example of this was a newspaper that announced it would award a gold pocket watch to the policeman who succeeded in catching a serial killer on the loose at the time.[22] In this way, imported timepieces slowly made their way down from the upper class into the middle class.

Another catalyst in the spread of timepieces during the third decade of the Meiji period (1888-1898) was the importing of metal alarm clocks from Germany. Affordably priced at less than two yen, these allowed families without the means to buy an American grandfather clock to own their own timepiece.[23]

It is, however, difficult to find out how far timepieces made their way into the middle and lower classes, as well as how far into rural areas. We do have records for a certain Hara Chōemon, from a family of village headman status in Tsuchizawa village, Naka county, Kanagawa prefecture, whose household accounts show that he paid 25 sen in 1884 to have a timepiece repaired in Odawara; this shows that by that time timepieces had penetrated even into rural areas. The only other consumer durables he purchased during that year were an ordinary lamp for 22 sen, and a lamp with a stand for 50 sen. The accounting books for the Tomizawa household, silk cultivators and formerly village headmen in Tama village, Kita-Tama county, Tokyo, show that in 1890, 50 sen was paid for watch repair, 45 sen was paid to repair a large clock, and 10 sen 6 ri (1 ri = 100 sen) was paid for a courier to Hachiōji. The first was probably for a pocket watch, the second for a grandfather clock, and the third showed that they were sent to a place several kilometers away to be repaired. Imported timepieces were a consumer durable of considerable value, and were thus taken good care of.[24]

Domestic timepiece sellers encouraged sales of imported timepieces to families and individuals. Among them were many former Japanese timepiece craftsmen who had to give that up and switch over to sales of the new Western timepieces. Hattori Kintarō had worked at the old Kobayashi Clock Store under a Japanese timepiece maker there and then went independent, riding the rail link between Shinbashi and Yokohama (the present Sakuragi-chō) every day to visit the Swiss trading firms, engaging in retail sale of imported timepieces. This business would one day grow into the Seiko watch company.[25] Retail timepiece stores began to pop up in prefecture capitals and large towns, procuring their merchandise from Tokyo and Osaka wholesalers who negotiated directly with foreign trading firms, making timepieces much more affordable for consumers throughout the country. Table 1 shows the increase in timepiece stores. In 1883, there were already 600 timepiece stores spread out across thirty-five prefectures, growing to 4,000 stores by the end of the Meiji period (1912), and found in all prefectures except Miyazaki and Okinawa. It is thought that many of the retail stores in the provinces were started by people who had done a period of apprenticeship in the larger firms in the big cities, and

then returned home to start their own business.[26]

Urban wholesalers of imported timepieces actively used a variety of marketing techniques, including distributing industry news sheets and price lists to retailers and placing advertisements in newspapers and magazines. And that is not all. Between 1887 and 1897 wholesalers and the large retailers began either independent or in some cases joint production of grandfather clocks. Indeed, during the Second Domestic Industrial Exhibition in 1881, craftsmen who had previously worked on Japanese timepieces displayed two wall clocks, one stand clock, and three pocket watches. These items were, however, almost completely hand-made, and could not compete with imported timepieces either in terms of cost, quality, or production quantities, and therefore could not survive as a business enterprise. The actual beginning of modern Japanese timepiece manufacture was with the establishment of a factory in 1888 by Hayashi Shihei, a large Nagoya retailer of timepieces. Hayashi hired dozens of workers and produced 1,000 grandfather clocks a year using machine tools for the first time.[27]

Table 1. Increase in the Number of Retail Watch and Clock Stores

Prefecture	1883	1911	Prefecture	1883	1911
Tokyo	201	605	Hiroshima	29	92
Kanagawa	18	101	Yamaguchi	11	60
Chiba	8	90	Tottori	8	45
Saitama	5	55	Shimane	---	22
Gunma	5	101	Kagawa	---	31
Tochigi	2	84	Tokushima	---	20
Ibaraki	---	49	Ehime	11	20
Shizuoka	11	108	Kochi	3	6
Aichi	42	185	Fukuoka	6	105
Gifu	8	63	Oita	7	13
Yamanashi	---	33	Saga	4	6
Nagano	11	150	Nagasaki	1	52
Niigata	16	165	Kumamoto	3	48
Toyama	1	34	Miyazaki	1	---
Ishikawa	11	50	Kagoshima	10	48
Fukui	7	35	Okinawa	---	---
Kyoto	88	120	Fukushima	---	171
Osaka	40	359	Miyagi	6	90
Hyogo	3	84	Iwate	1	54
Shiga	13	33	Yamagata	---	105
Mie	1	52	Akita	---	92
Nara	---	22	Aomori	---	53
Wakayama	4	23	Hokkaido	---	173
Okayama	10	72	Total	605	3,989

Source: Meiji 16 (1883) data: *Teikoku tōkei nenkan*. Meiji 44 (1911) data: calculated from *Nihon zenkoku tokei shōkō jinmei* (Who's Who in Japanese Timepiece Companies), appendix to Imamura Shinji, ed., *Nihon tokei shōkōshi* (History of the Manufacture and Sale of Timepieces in Japan).

(*Seikō Library sōsho* reprint.)

After Hayashi, the third Meiji decade (1888-1897) saw five timepiece factories open in Nagoya, four in Osaka, one in Kyoto, and two in Tokyo. The majority of these were built using funds from timepiece firms. It might seem odd that timepiece firms, whose business mainstay was selling imported timepieces, would also manufacture them, but they were able to use the sales routes and trust they had developed with their customers to sell their own domestically made timepieces.[28]

Domestic production of grandfather clocks brought about a sharp decrease in the price, allowing the market to expand to include families in the lower-income bracket that could now purchase what had previously been out of their reach. This was a major factor in the spread of timepieces. Consumers associated grandfather clocks with the U.S.-made eight-corner long-tail model or what was popularly known as the "four eyes" model, so Japanese makers produced models with similar casings—i.e., imitations. Consumers trusted imported items over domestically produced ones, and Japanese timepieces had to be priced at around half of what the imported items were going for if they were to sell at all. For example, if a dozen U.S.-made grandfather clocks sold for 70 yen, the same number of their domestically made counterparts would sell for 35-38 yen. This had an immediate effect, and in 1894, 220,000 domestic grandfather clocks were sold, which was almost double the highest figure reached for imported timepieces: 130,000.[29] The numerous factories which had sprung up all over the country, as described above, fell into cut-throat price wars that brought the price for a dozen grandfather clocks in 1900 down to 21 yen. One result of this was that the majority of these companies were forced into the red and went out of business, leaving a few factories in Nagoya where production costs were low, and Seikōsha in Tokyo, which had specialized in production of high-end grandfather clocks.[30]

The price and quality of domestically produced grandfather clocks was sufficient to satisfy the general public. The beginning of the twentieth century saw the number of U.S.-made grandfather clocks diminish to almost none. German metal stand clocks, however, continued to be imported, although they too experienced a rapid drop once Seikōsha began domestic production of a similar product in 1907. Domestic production of pocket watches also faced difficulties, although of a different nature from grandfather clocks: precision manufacturing processes were needed for all the small, intricately designed parts; special miniature machine tools were required; the power springs, the hair springs for the balance, the precious stone for the bearing, the *cloisonné* watch face, the glass cover, and many other parts were impossible to make using Japanese materials and technologies; there were many defects because the accuracy demanded by the small dimensions made it very difficult to fit the pinion into the backing plate in the right position; much time and skill was required to assemble the watches and adjust the time. Imported watches had already overcome these obstacles through years of work by timepiece factories in Switzerland and the U.S. to raise the skill level of their workers and by

developing special automated line machinery and tools. In addition to this, competition between the U.S. and Switzerland had helped make watches smaller and slimmer, so if Japanese makers wanted to keep pace with trends in this market dominated by imported timepieces, they had to constantly match the new models that came out, which required renovating their machinery and tools and increasing the quality of the precision processing, assembly, and finishing. Otherwise it would be impossible to compete with the imported watches. British and French pocket watchmakers had already thrown in the towel.

At the beginning of the twentieth century, Osaka Watch Co., Ltd. and Japan Pocket Watch Co., Ltd. in Tokyo started domestic production of pocket watches using American machinery and Swiss know-how gained through apprenticeship. They both, however, failed after a few years. At the same time, Seikōsha implemented a policy whereby the profits from their gold and silver cases for grandfather clocks, stand clocks, and imported pocket watches were used first to import and then gradually switch over to production of parts which were difficult to make. They kept at it and eventually had success in continuous production of the "movement" (the moving mechanism) at the heart of pocket watches. This is especially noteworthy, as it was the only example outside the U.S. and Switzerland of success in the watch-making business.[31]

Unlike grandfather clocks, the number of watches imported continued to grow until the beginning of the Shōwa period (starting in 1926), maintaining a dominant share of the Japanese market ahead of their domestically produced counterparts. While one factor was the role played by the deep-rooted worship of foreign made watches as jewelry, the inroads Swiss pocket watches had succeeded in making into the women's market with their compact and slim size was also a contributing factor.[32]

As with grandfather clocks, domestic pocket watches had to be cheaper than imported items. According to the price list of the Hattori Watch Store in 1906, Swiss-made gold watches sold for 35-100 yen, U.S.-made gold watches for 37-150 yen, while Seikōsha made none, and Swiss-made silver watches sold for 7.50-12.75 yen, while Seikōsha's went for 6.25-7.50 yen. It is only with the nickel pocket watches that Seikōsha and Swiss prices are about the same, at around four yen.[33] Around the beginning of the twentieth century, when imported timepieces still held most of the market, it was commonly said that "high-range watches are gold, middle-range watches are silver, and 100 percent-nickel mechanisms are not so far off. But nickel is not so expensive—maybe two yen. So it's not the mechanism or the appearance, but wearing a watch worth ten yen or more that will be the real value people will get from their watches."[34] Domestic pocket watches first aimed for the general public, and then aimed higher with gold and silver versions of their "Excellent," an imitation of the U.S. Waltham watches, thereby succeeding in increasing their sales.[35]

There is no doubt that this kind of inexpensive pocket watch increased the size of the domestic market, just as grandfather clocks had. Behind the spread of timepieces as the first Western consumer durable in Meiji period Japan was the entrepreneurship of

Japanese makers aiming at taking the place of imported timepieces in the market.

3 ESTIMATING THE SPREAD OF TIMEPIECES

Looking at year-on-year changes in ownership of consumer durables such as cars and household appliances, we notice a pattern of extremely low figures initially, followed by a sudden rise after a certain amount of time. Once ownership reaches 20-30 percent, those goods spread very rapidly until they reach saturation at around 80-90 percent, and then the numbers settle down again. Graphing this process with ownership on the Y-axis and time on the X-axis produces a curve that looks like an S on its back. I have carried out quantitative calculations for the diffusion rate of timepieces in the Meiji period.

As mentioned above, clocks were a consumer durable distributed one to a household, and watches were owned by individuals. It is therefore easier if I consider each separately. I decided to simplify the task by calculating the number of timepieces owned, and the percentage ratio of ownership for 1877 and every tenth year thereafter. At this time, clocks and watches were valuable assets, and as such were used for up to forty or fifty years. Even if a clock or watch left the possession of its initial purchaser, we can assume it continued to be used. Let us assume that the figure for total domestic ownership is total cumulative supply (imports + domestic production – exports) minus ten percent. For clock ownership, the ten percent subtracted from the cumulative supply includes clocks installed in public and official institutions and timepieces destroyed by fire, flood, or other disaster, or broken and irreparable. The denominator for clock ownership should be the total number of households. The results are shown in Table 2.

The tendency shown in this table is the same as the time series curve for general consumer durables. In 1877, only one in thirty households owned a clock. In 1887, this figure only rose to one in thirteen. However, the decade following this showed a rapid spread of timepieces. This corresponds to the appearance of domestic grandfather clock factories and the drop in prices described above. By 1897, almost one in every three households owned a clock, with a probable geographic distribution of half of all urban residents owning clocks, and rural ownership limited to wealthy landowners. With the spread of clocks reaching this level, the desire increased among households heretofore without a clock to purchase one. Inexpensive German and domestic alarm clocks satisfied demand among low-income households in the decade from Meiji 30 through 39 (1897-1906), or acted as a second clock. By 1907 clocks were to be found in over 70 percent of all households, becoming commonplace in both urban and rural homes.

For individual watch ownership, we should use the overall population figure, rather than the number of households. Between 1868 and 1912 (the span of the Meiji period), the population of Japan grew from 35 million to 43 million, an increase of 30 percent.

Table 2. Estimated Clock Ownership (units are thousands, except diffusion rate)

Year	Cumulative Imports (A)	Cumulative Domestic Production (B)	Cumulative Exports (C)	Gross Domestic Stock (D) (=A+B-C)	Net Domestic Stock (=90%x D)	Number of Households	Diffusion Rate (%)
1877	265	0	0	265	240	7,500	3.2
1887	695	0	0	695	625	7,771	8.0
1897	2,125	750	50	2,825	2,540	8,058	31.5
1907	3,448	5,535	1,551	7,432	6,690	9,250	72.3

Note: Import and export data from *Gaikoku bōeki nenpō*, published by the Ministry of Finance; domestic production data from Ministry of Agriculture and Commerce, statistical records kept by prefectures, and company data; data on number of households from *Nippon teikoku tokei tekiyō*. Figures for Meiji 10 (1877) are estimates.[36]

These figures are greater than for any Western European country at the time, and higher than half the population of the U.S. It is therefore understandable that Swiss merchants concentrated on Japan as a market with latent demand for pocket watches, as Japan had already started down the path to Europeanization, even going so far as to implement dramatic changes in its time system. However, the spread of watches lagged behind that of clocks. At that time, watches were more an expensive accessory than an article of practical use, and as described above, traditional Japanese attire limited the use of watches, as they could not be worn together. Table 3 shows trends in the diffusion of watches. At this point there was still no export, so I have taken the total of imports and domestic production as the supply figure. The number of people capable of traveling and purchasing watches abroad is negligible. I arrived at a total individual ownership number by deducting 10 percent, including unsold inventory and natural attrition, from the cumulative supply total.

Depending on how you look at it, the 0.2 percent of the population that owned watches, or one person in 500, in 1877, six years after the revision of the calendar, could be considered a large amount. It does seem to indicate that high officials in the government, the bureaucracy, and the military, as well as wealthy merchants and landowners nearly all owned pocket watches. The problem was that even by 1887, diffusion had only reached 0.8 percent, which meant that pocket watches remained a status symbol owned by only a select few. In 1897, diffusion finally reached 4.2 percent. This is one person in 25, although our population figure includes children and women, who would not have owned a pocket watch. So if we limit ourselves to male adults as a denominator, this figure rises to one person in ten.

Table 3. Estimated Watch Ownership (units are thousands, except diffusion rate)

Year	Cumulative Imports (A)	Cumulative Domestic Production (B)	Total (C) (=A+B)	Net Domestic Stock (D) (=90%xC)	Population	Diffusion Rate (%)
1877	108	0	108	97	35,000	0.2
1887	364	0	364	327	38,500	0.8
1897	2,008	0	2,008	1,807	43,230	4.2
1907	5,171	250	5,320	4,880	48,820	10.0

Estimates are as for clocks.[37]

We can safely say that it is from this time that the diffusion curve begins to rise. Domestic production began around this time. At the end of the Meiji period ownership rose to one in ten of all Japanese, with one in four adult males owning a pocket watch. Specifically, this meant that it had by this time become normal for civil servants, company employees, shop owners, seamen, low-ranking military officers, public officials in rural villages, and even students to own either pocket watches or the new wristwatches, which had recently started to be produced. As mentioned above, the appearance of wristwatches helped develop a new market made up of wealthy women.

As these figures for the spread of timepieces show, during the first half of the Meiji period (1868-approximately 1890), few Japanese owned timepieces and it is reasonable to say that for the most part the vague time divisions and variable-hour time system from the Edo period remained firmly in the daily consciousness of the people. In Tokyo when it was still a smaller and quieter place, most residents did not own any timepieces whatsoever, and the midday cannon shot in the Marunouchi district was the only way of knowing when morning had turned into afternoon. Even in places that did have timepieces, they often ran fast or slow, and the spring had to be wound every day, so the midday cannon was helpful in setting the correct time. It was only with the arrival of the second half of the Meiji period (approximately 1890-1912) that ownership of grandfather clocks became the norm in Japanese households, bringing with them a concept of time based on hours of fixed length divided into minutes. Individual ownership of watches then made it possible for people to carry a timepiece around with them and check the time whenever they wanted to. Even people without watches began paying closer attention to the time, using public clocks. Spread of timepieces, the first Western consumer durable, gradually changed the sensibility of the average Japanese with respect to time over the course of the Meiji period. What made possible such changes in the social system were the supply of the hardware, at first imported and then domestically produced, and the formation of a market.

NOTES

[1] Uchida Hoshimi 内田星美, ”Sakoku ga unda shigenjikyu no shisutemu,” in Kawakatsu Heita 川勝平太, ed., *Sakoku o hiraku* (Dōbunkan, 2000), p. 169.

[2] Uchida Hoshimi, “Kohaba shimamomen to sono daitai taishū iryo ni okeru kakushin,” *Jinbun shizen kagaku ronshū*, no. 95 (Tokyo Keizai Daigaku, December 1993), p. 121.

[3] Shibusawa Keizō 渋沢敬三, ed., *Meiji bunkashi, seikatsuhen* (Yōyōsha, 1955), pp. 406-408. Shūkan Asahi, ed., *Nedan no Meiji, Taishō, Shōwa fūzokushi*, vol. 2 (Asahi Shimbunsha, 1987), p. 53.

[4] Takabayashi Hyōei 高林兵衛, *Tokei hattatsushi* (Tōyō Shuppan, 1924), pp. 45-59. Yamaguchi Ryūji 山口隆二, *Nihon no tokei*, (Nihon Hyōron, 1942), pp. 53-56.

[5] Yamaguchi, pp. 32-33.

[6] Oda Sachiko 小田幸子, *Wadokei zuroku* (Seikō Tokei Shiryōkan, 1994).

[7] Tsunoyama Sakae 角山栄, *Tokei no shakaishi* (Chuō Kōron Sha, 1984), pp. 68-86.

[8] Oda, *Wadokei zuroku*.

[9] Nihon keizai shinbun, 8 September 2000.

[10] Oda, *Wadokei zuroku*, p. 5; Saitō Kuniharu 斉藤国治, *Kodai no jikoku seido* (Yūzankaku, 1995), pp. 281-289.

[11] Oda, *Wadokei zuroku*, pp. 6, 67.

[12] Asahina Sadaichi 朝比奈貞一 “Tokei,” in *Nihon kagaku gijutsushi* (Asahi Shimbunsha, 1962), p. 582.

[13] *Shinbun zasshi*, November 1873.

[14] Seiko Library sōsho, vol 3, *Kairekiben, tokei shōsetsu* (Seiko Tokei Shiryōkan, 1978).

[15] Kaichi Shinpō, 29 April 1870.

[16] Yūbin Hōchi, 31 July 1876.

[17] Kawai Kikakushitsu, *Tokeishi nenpyō* (1973), pp. 5-13.

[18] Uchida Hoshimi, *Tokei kōgyō no hattatsu* (Hattori Seikō, 1985); see part 1.

[19] Ibid., pp. 141-143, 162-168.

[20] Ministry of Finance, *Dainihon gaikoku bōeki nenpyō*, various years. Naikaku Tōkei Kyoku, Dai-2-kai *Nihonteikoku tōkei tekiyō.*

[21] Uchida, *Tokei kōgyō no hattatsu*, pp. 148-153. *Nedan no Meiji, Taishō, Shōwa fūzokush*i, vol. 1, pp. 583, 607.

[22] *Jiji Shinpō*, 1 May 1898: “Reward for Catching the Criminal. A naked body was discovered at the Ochanomizu embankment on the 27th, covered with injuries, which indicated a gruesome murder. The identity of the victim is as yet unknown and there are no clues as to who the culprit might be. The spate of unusual cases we have seen in recent days has proven impossible to solve, and is taxing the skills of the police force. *Jiji Shimpō* has therefore decided to award a gold pocket watch to the police officer who finds the culprit, as a modest expression of encouragement.”

[23] Uchida, *Tokei kōgyō no hattatsu*, pp. 148-150.

[24] *Meiji bunkashi, seikatsuhen*, pp. 501, 521.

[25] Hirano Mitsuo 平野光雄, *Tokeiō Hattori Kintarō* (Jiji Tsūshin, 1972), pp. 22-35.

[26] Uchida, *Tokei kōgyō no hattatsu*, p. 174.

[27] Ibid., pp. 216-225.
[28] Ibid., pp. 186-188.
[29] Ibid., pp. 147-148.
[30] Ibid., p. 197.
[31] Ibid., pp. 341-344.
[32] Ibid., pp. 152, 400.
[33] *Hattori Tokeiten eigyō ichiran* (1907), pp. 1-25.
[34] "Meiji jidai no fūzoku, ge," *Nihon fūzokushi kōza*, vol. 3 (Yūzankaku, 1929), pp. 403-404.
[35] Uchida, *Tokei kōgyō no hattatsu*, p. 345.
[36] Ibid., pp. 145, 149.
[37] Ibid., pp. 147, 152.